DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/26/2011 has been entered.

Response to Request for Continued Examination

2. This is the response to request for continued examination filed on 02/15/2011.

3. Claims 1-3 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over JOHNSON (U.S. 5,520,708) in view of KOVACS (WO 03/040081).

JOHNSON teaches a method to reduce the crystallization temperature of a mixture of a fatty acid oil ester-petroleum distillate fuel blend. JOHNSON teaches in lines 15 – 18 of column 3 that the esters used are prepared by transesterification of native oils. Preferably, the esters are taught in lines 19 - 32 of column 3 to be prepared

by a type of **transesterification** known as alcoholysis in which the acyl groups in the triglycerides of the oils are exchanged with an alcohol such as **methanol**, so that nearly all the acyl groups are recovered as methyl esters.

JOHNSON teaches an example in lines 65 – 67 of column 3 and lines 1 – 14 of column 4 where a basic catalyst of sodium alkoxide is used and **stirred vigorously** with the reactants at **32°C (between 25 and 60°C)**.

JOHNSON further teaches in lines 19-31 of column 4 that the reaction mixture was then extracted with hexane, washed with water to induce a phase separation into a upper phase which is an ester-rich layer and a lower phase ((**b) forming a layer containing the crude methyl ester).**

JOHNSON does not seem to explicitly state that the upper phase containing the methyl ester is intensively mixed with a strong acid.

However, JOHNSON further teaches that an acid such as **sulfuric acid or hydrogen chloride** may be used as the acid catalyst when large amounts of free fatty acids are present in the oil.

JOHNSON does not seem to explicitly state that the methyl ester is intensively mixed with to form an emulsion.

However, KOVACS a method for improving the process of transesterifying a vegetable oil in lines 4-18 of page 7. A vegetable oil is transesterified with a C1-C4 alkanol in the presence of a catalyst whereupon a polar phase and an apolar phase are formed. The polar phase containing the glycerol by-product is removed, while the apolar phase comprising the fuel is subject to a refining procedure. The apolar phase

comprising non-transesterified vegetable oil, aliphatic hydrocarbon solvent and the transesterified product is reacted in a further step with a C1-C4 alkanol in the presence of a catalyst until a transesterification conversion of 95-98% is attained. KOVACS further teaches on the second paragraph of page 3 and lines 1-13 of page 4, a method in which the process that JOHNSON teaches can be performed in an assembly of a static mixer, a heat exchanger and a homogenizer with reduced time for transesterification and phase separation. The reactants are reacted in a static mixer, and then the mixture is subjected to a high shear **(in-line mixing)** in the homogenizer to form **an emulsion**.

It would be obvious to one of ordinary skill in the art to take the upper phase that JOHNSON teaches and apply the phase to the steps that KOVACS teaches. Specifically, it would be obvious to one of ordinary skill in the art to perform the transesterification that JOHNSON teaches, separate the ester-rich phase containing the methyl esters by inducing a phase separation **((b) separating the layer from the rest of the reaction mixture)**. The ester-rich phase is then refined by the process that KOVACS teaches. The ester-rich phase is mixed with **sulfuric acid**, heated to 32°C, subjected the mixture to high shear **(in-line mixing)** to form an **emulsion ((c) intensively inline mixing the crude methyl ester later obtained at temperature between 25 and 60°C with a strong acid to form an emulsion)**. The twice-reacted reaction mixture can then be again extracted with hexane, washed with water to induce a phase separation into a upper phase which is an ester-rich layer and a lower phase **((d) separating an ester layer form the emulsion formed).**

The motivation to do so can be found in lines 1-19 of page 4 of KOVACS. KOVACS teaches that to reach a high conversion rate, the phase containing the transesterified product would need to be reacted once again. Furthermore, repeating the steps of a reaction is known to one of obvious skill in the art to increase conversion.

JOHNSON teaches in lines 26-28 of column 4 that the ester–rich layer may be washed with additional water until it became clear **(subjecting the separated ester later to a thorough water wash).**

JOHNSON does not seem to explicitly teach a subsequent drying step.

However, it would be obvious to one of ordinary skill in the art to perform drying step following a water washing step for a compound intended to be used as biodiesel fuels.

The motivation to do so would be known to one of ordinary skill in the art. Water has a deleterious effect on biodiesel fuels.

JOHNSON does not seem to explicitly teach a complex former such as citric acid.

However, KOVACS teaches in lines 1-14 of column 6 that citric acid may be used to remove non-hydratable phospholipids to produce refined vegetable oils that are suitable starting substances for biodiesel fuel production.

It would be obvious to one of ordinary skill in the art to add the citric acid that KOVACS teaches along with the sulfuric acid during the refining process following the first transesterification.

The motivation to do so would be to remove the non-hydratable phospholipids.

Therefore, the invention as a whole would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Regarding claim 3, JOHNSON does not appear to explicitly state the water wash is carried out in a wash column according to the counter current principle or by means of a mechanically intensive mixer.

However, it would be obvious to one of ordinary skill in the art to use a separatory funnel to perform the water washes. A separatory funnel is an intensively mixer.

One of obvious skill in the art would recognize that a separatory funnel is a common piece of equipment that is used in water washes.

A separatory funnel is not mechanical in design but it would be obvious to one of ordinary skill in the art to mechanize the mixing process in a separatory funnel since applicant has not stated that performing the mixing mechanically solves any stated problem or is for any particular reason and the separatory funnel can be mixed by hand or mechanically.

Therefore, the invention as a whole would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Response to Arguments

6. Applicant's arguments filed 01/26/2011 have been fully considered but they are not persuasive.

Applicant argues that the Declaration has not been given the proper consideration and that the examiner is substituting his own opinion. As stated before,

the Declaration is insufficient to overcome the rejections because the showing is not commensurate in scope with the claims and fails to set forth facts. The inventor admits that the application does not specify that the strong acid is in dilute aqueous form, but also argues that it would be obvious to one skilled in the art. This is not supported by fact. An oil emulsion does not necessitate the existence of water. For example, Petersen teaches in "Studies on Nonaqueous Emulsions" of nonaqueous emulsions containing glycerin and olive oil. Furthermore, JOHNSON teaches a phase separation step that involves using a water wash. One of ordinary skill in the art would reasonably expect that a small amount of water may be mixed in the upper phase containing the transesterified product.

Applicant argues that JOHNSON fails to disclose intensive mixing with a strong acid and a complex former. Examiner agrees. However, the absence of intensive mixing with a strong acid and a complex former is remedied by the combination of KOVACS. KOVACS teaches that for a transesterification reaction, the phase containing the transesterified product and non-transesterified material can be reacted again with the same components of the transesterification reaction. Specifically, a vegetable oil is reacted with an alkanol with a catalyst. The products are separated into a polar phase containing glycerol and an apolar phase containing the transesterified product and non-transesterified reactants. The apolar phase containing the transesterified product and nontransesterified is mixed with an alkanol and a catalyst again. KOVACS teaches that by repetition, the yield can be increased to 95-98%. Performing a reaction, isolating a

fraction and performing the reaction again with the isolated fraction to increase yield is known to one of ordinary skill in the art of chemistry.

Applicant attacks the teachings of KOVACS, stating that JOHNSON does not teach the use of a homogenizer to form an emulsion. Applicant further states that JOHNSON does not discuss an emulsion. Examiner agrees that JOHNSON does not explicitly teach the formation of an emulsion. However, one of ordinary skill in the art would, with the teachings of KOVACS and JOHNSON, arrive at the use of intense in-line mixing to form an emulsion, since KOVACS teaches using a homogenizer with the process that JOHNSON teaches would shorten reaction time and phase separation time. In response to applicant's assertion that the formation of an emulsion differs form that of the art, KOVACS explicitly states in the discussion of JOHNSON's method in lines 17-25 of page 3, and lines 1-12 of page 4, that a mixture of vegetable oil, alkanol and catalyst is subjected to high shear to form an emulsion and where the emulsion proceeds to equilibrium conversion and segregates in the settler.

Applicant argues that examiner is using an impermissible "obvious to try" standard. Examiner reiterates that performing the same reaction again to increase yield would be obvious to one of ordinary skill in the art of chemistry. KOVACS teaches reacting a phase with the product and unreacted reactants again after separating the proper phase. A water wash extraction is taught to separate the phases. One of ordinary skill in the art would expect that a water wash extraction for the same process would yield the proper phase.

Applicant argues that the make up of the emulsion would be different given the

water wash that JOHNSON teaches. Examiner disagrees. After separating the upper phase with the transesterified product and non-transesterified reactants, acid and alcohol would be added to the phase and inline mixed to form an emulsion.

Applicant argues that a separatory funnel is not a wash column nor does it work with the counter current principle. Examiner disagrees. A separatory funnel can be used as a wash column. The mixing of a separatory funnel can be mechanized and would be obvious to one of ordinary skill in the art. Applicant has not stated or given any particular reason why the separatory column can not function to carry out the water washing. Furthermore, it would be obvious to one of ordinary skill in the art to substitute known apparatuses to perform the water wash step in the method.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MING CHEUNG PO whose telephone number is (571)270-5552. The examiner can normally be reached on 9:00 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571)272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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